Unit 15
Day 3
Factor Theorem

Factor theorem:

The polynomial x-k is a factor of the polynomial P(x) iff P(k)=0.

1) $P(x)=x^3-2x^2-x+2$ $k=1$

1	1	-2	-1	2
		1	-1	-2
	1	-1	-2	0

$P(1)=0$, 1 is a zero of P

$\Rightarrow (x-1)$ is a factor of P

Find the polynomial of lowest degree with following roots (zeros, solutions).

1) 3,-2

2) $3+\sqrt{2}$, $3-\sqrt{2}$; f(2)

√

Conjugate zero theorem:

If P(x) is a polynomial having only real coefficients and if z=a+bi is a zero of f(x), where a and b are real numbers, $\overline{z}$=a-bi is also a zero of f(x).

Find a polynomial of lowest degree with only real coefficients and having the given zeros.

$F(x) = x^3 - 4x^2 + 14x - 20$

1) 2, 1+3i, 1−3i

$F(x) = (x-2)(x-(1+3i))(x-(1-3i))$

$= (x-2)(x-1-3i)(x-1+3i)$

$= (x-2)(x^2 - x + 3xi - x + 1 - 3i - 3xi + 3i + 9)$

$= (x-2)(x^2 - 2x + 10) = x^3 - 2x^2 + 10x - 2x^2 + 4x - 20 = x^3 - 4x^2 + 14x - 20$

Find a polynomial of degree 3 with only real coefficients that satisfies the given conditions.

2) -3, 1, and 4; $f(2)=30$

$$g(x)=a(x+3)(x-1)(x-4)$$

$$30=a(2+3)(2-1)(2-4)$$

$$30=a(5)(1)(-2)$$

$$30=-10a$$

$$-3=a$$

$$g(x)=-3(x+3)(x-1)(x-4)$$

$$g(x)=-3(x^2+2x-3)(x-4)$$

$$g(x)=-3(x^3+2x^2-3x-4x^2-8x+12)$$

$$g(x)=-3(x^3-2x^2-11x+12)$$

$$g(x)=-3x^3+6x^2+33x-36$$

Find a polynomial of degree 3 with only real coefficients that satisfies the given conditions.

3) -2, -1, and 2; f(1)=12

$$f(x) = -2x^3 - 2x^2 + 8x + 8$$

Find a polynomial of degree 3 with only real coefficients that satisfies the given conditions.

2) 3, -4, and 1; f(2)=-18

HW pg 300 36-50 even